

ACT Research

“Ready for College and Ready for Work: Same or Different?”

Texas Senate Education Committee

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ACT Southwest Region

ACT™

Ready for College and Ready for Work: Same or Different?

FACT:

40 percent to 60 percent of jobs in 2015 DO NOT CURRENTLY EXIST.

FACT:

Only 21 percent of jobs in the U.S. require a bachelor's degree.

FACT:

75 percent of jobs in the U.S. require training beyond high school but below a four-year degree.

We can't afford to have one expectation for students who plan to attend college and another for those who plan to enter the workforce or workforce training programs after high school. If we educate some students to a lesser standard than others, we narrow their options to jobs that, in today's economy, no longer pay well enough to support a family."

ACT CEO Richard L. Ferguson

Ready for College and Ready for Work

**College Preparatory Courses - or - Technical
Courses?**

**What's a student to do to prepare for the future if
the future is unknown?**

**What do employers expect? What do
colleges/universities expect?**

Ready for College and Ready for Work

We need a bridge to the future with clear expectations from employers and educators so students can prepare themselves - a Bridge Between Education and Business with common, clear understandings about readiness for college and readiness for the workplace.

Ready for College and Ready for Work

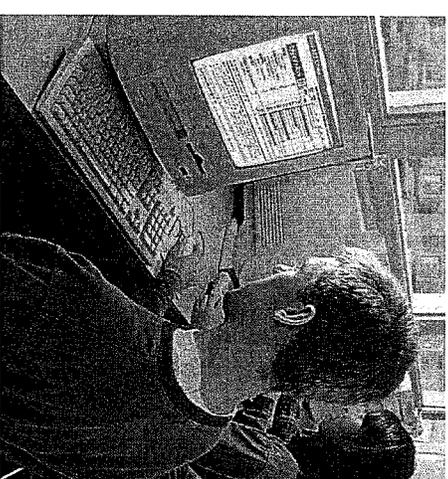
Context

- Long-held belief that students who enter college need higher-level skills than students entering workforce.
- **BUT** if students entering the workforce don't have the foundational skills to learn job-specific skills, how can they:
 - Seek and retain jobs in a changing economy?
 - Earn a wage sufficient to support a family?
 - Have potential for advancement?

Ready for College and Ready for Work

Context:

- Up to now, there has not been any *empirical* research examining whether college and workforce readiness represent the same or different levels of knowledge.



Ready for College and Ready for Work

Query:

**Ready for college and ready for work:
Same or different?**



Ready for College and Ready for Work

Steps in Research Study:

- 1. Defined what it means to be ready for work.**
- 2. Identified knowledge and skills needed by workers entering these jobs.**
- 3. Statistically related the level of skills needed for workforce readiness to college readiness.**

Ready for College and Ready for Work

Step 1: What does it mean to be ready for work?

Focus is on jobs that:

- **Require a high school diploma**
- **Pay a wage sufficient to support a family**
- **Offer the potential for career advancement**

**O*NET (US Department of Labor) Zone 3
jobs meet these criteria.**

Ready for College and Ready for Work

O*NET jobs require:

- A high school diploma but not a bachelor's degree
- Some combination of vocational training/on-the-job experience

Examples include: electricians, auditing clerks, construction workers, food service managers, plumbers.

Ready for College and Ready for Work

In this study, we essentially defined “ready for work” as “ready for workforce training” since the target jobs require foundational reading and mathematics skills necessary to learn job-specific skills after high school graduation.

Ready for College and Ready for Work

Step 2: What are the knowledge and skills

- needed by workers entering these jobs?**
- Examined job profiles from ACT's WorkKeys database for O*NET Zone 3 jobs.**
- Used the job profiles to identify the level of job skills needed to perform each job on the WorkKeys scale.**
- Identified the level of reading and math skills needed to enter the vast majority (90%) of Zone 3 jobs after high school.**

Ready for College and Ready for Work

Step 3: Are the skills needed for workforce readiness and college readiness the same or different?

- **Statistically related ACT's College Readiness Benchmarks on the ACT to the WorkKeys workforce training readiness levels identified through job profiling using a sample of over 450,000 high school juniors who had taken the ACT and WorkKeys assessments.**

Comparability between WorkKeys Job Profile Level 5 and ACT College Readiness Benchmarks in Reading and Mathematics

Table 1

WorkKeys Test	WorkKeys Readiness Level	Comparable ACT Score Range and College Readiness Benchmarks
Reading for Information	5	19-23 Benchmark = 21
Applied Mathematics	5	18-21 Benchmark = 22

Table 5

**Comparison of College and Workforce Training Readiness:
Mathematics Test Questions**

<p>ACT Mathematics 20-23 Range</p>	<p>WorkKeys Applied Mathematics Level 5</p>
<p>[Evaluate algebraic expressions by substituting integers for unknown quantities; solve routine first-degree equations]</p> <p>The number of bricks, B, needed to build a wall of uniform length L feet and uniform height H feet can be found by the equation $B = 7LH$. A wall of uniform height that is 20 feet long is constructed using 350 bricks. What is the height, in feet, of the wall?</p> <p>A. 1.75 B. <u>2.5</u> C. 17.5 D. 50</p>	<p>[Look up and use a single formula; perform single-step conversions within or between systems of measurement]</p> <p>A refrigeration system at your company uses temperature sensors fixed to read Celsius ($^{\circ}\text{C}$) values, but the system operators in your control room understand only the Fahrenheit scale. You have been asked to make a Fahrenheit ($^{\circ}\text{F}$) label for the high temperature alarm, which is set to ring whenever the system temperature rises above -10°C. What Fahrenheit value should you write on the label?</p> <p>A. -23°F B. -18°F C. <u>14°F</u> D. 26°F</p>

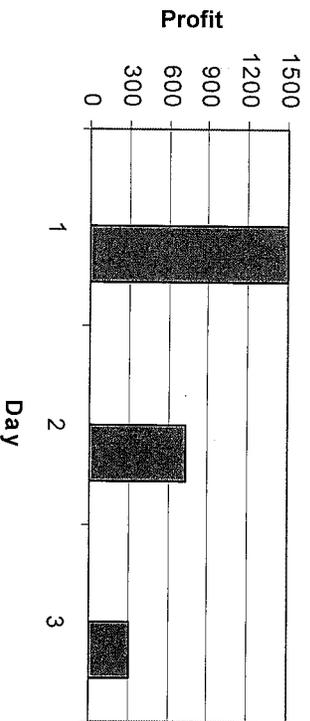
ACT Mathematics
20-23 Range

[Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average]

WorkKeys Applied Mathematics
Level 5

[Calculate percentages, percentage discounts, or percentage markups]

The Sunrise Preschool held its annual book fair for 3 days. The total profit for the 3 days was \$2,525. The profit, in dollars, is shown for each of the 3 days in the bar graph below.



Approximately what percent of the book fair's profit over the 3 days did the preschool make on Day 1?

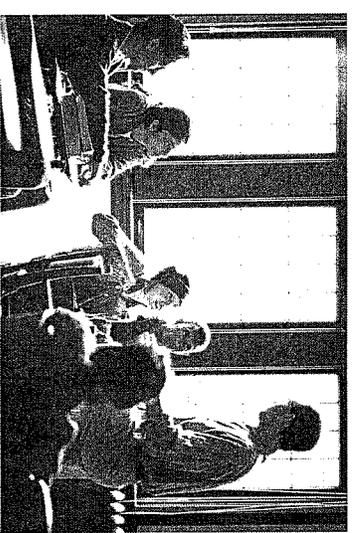
- A. 25%
- B. 33%
- C. 50%
- D. 60%

As a dietitian, you help clients manage their sugar intake. A popular fruit drink contains a total of 28 grams of carbohydrates. Of that total, 19 grams are sugar. About what percent of the total carbohydrates is the sugar?

- A. 7%
- B. 9%
- C. 15%
- D. 68%

Research Results

- Research results show that the level of readiness needed to enter workforce training programs and to enter college are comparable.
- Level of expectation for students entering jobs offering a wage that can sustain a small family is the same as that needed for college.



Implications of Research Results

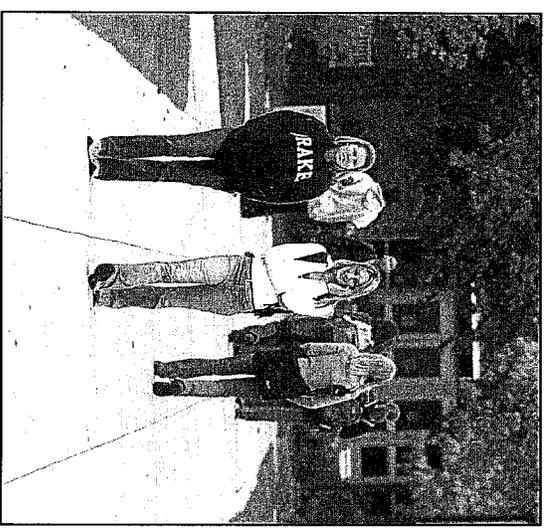
- **Readiness levels for students preparing for college and workforce training programs are comparable.**
- **All students should be educated to a common expectation that prepares them for college and workforce training programs.**
- **All high school graduates should be guaranteed the opportunity to become ready for college and work.**

Why Is This Research Important?

- **Results support state efforts to increase standards and expectations in high school.**
- **Results support state efforts to prepare all students so they have options after high school.**

Why Important?

- Important for the future of each and every student.
- Important for us as a state to improve our economy.
- Important for us as a nation to be competitive in today's global economy.



ACT Recommended Coursework

ACT Minimum Core

English: 4 years

Social Sciences: At least 3 years

Mathematics: At least 3 years

Natural Sciences: At least 3 years

• In the past, ACT has reported student performance by “Core” and “Less than Core” course patterns. Similar results are included in this report.

• ACT research shows that it is the *rigor* of high school courses—rather than simply the number of courses—that best prepares students for college. ACT data show that students who take and work hard in higher-level courses such as Physics and an advanced math class beyond Algebra II are most likely to be college ready.

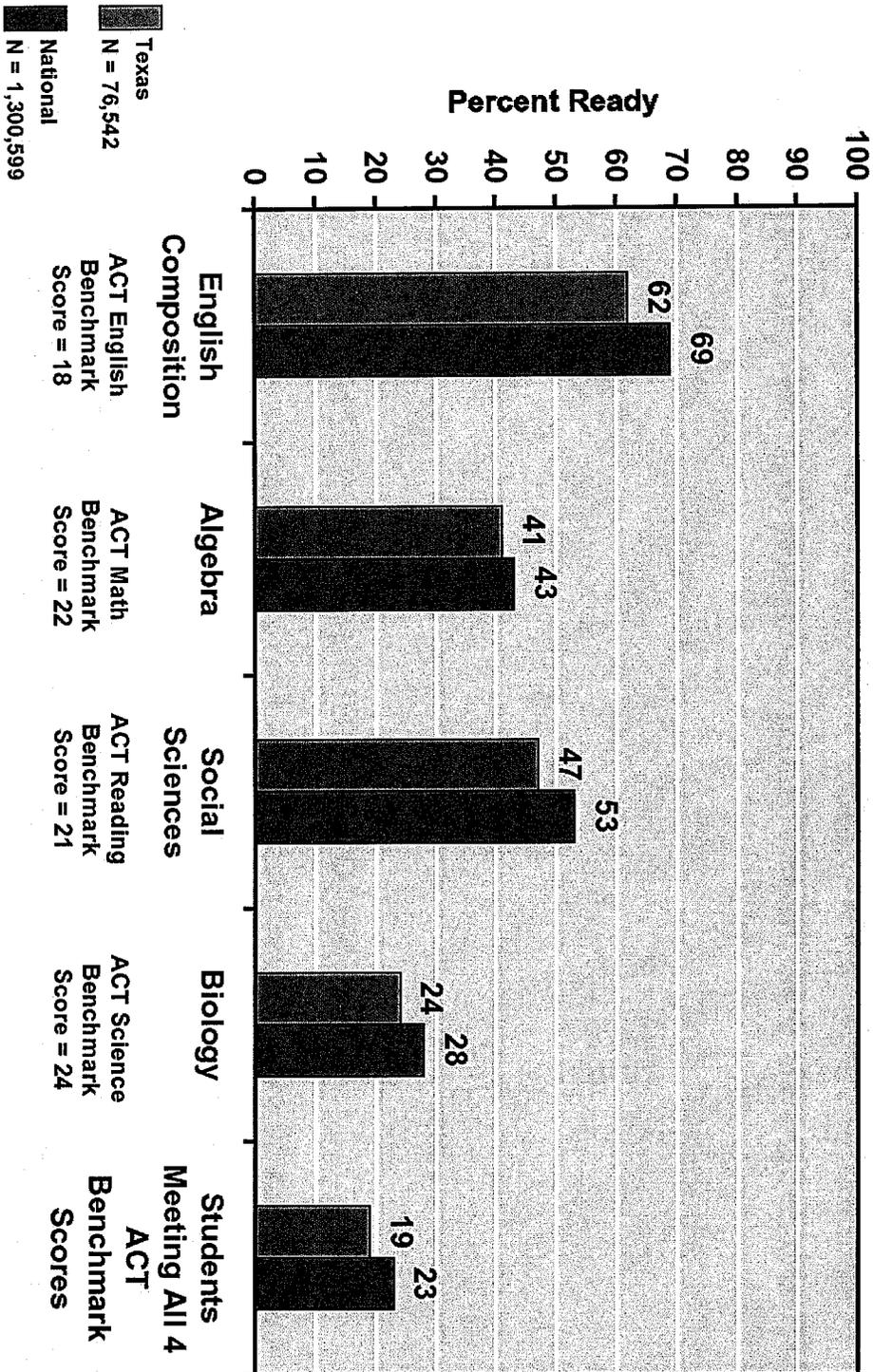
ACT College Readiness Benchmark Scores

Through collaborative research with postsecondary institutions nationwide, ACT has established the following **College Readiness Benchmark Scores:**

ACT Subject Area Test	College Course(s)	College Readiness Benchmark Score
English	English Composition	18
Math	Algebra	22
Reading	Social Sciences	21
Science	Biology	24

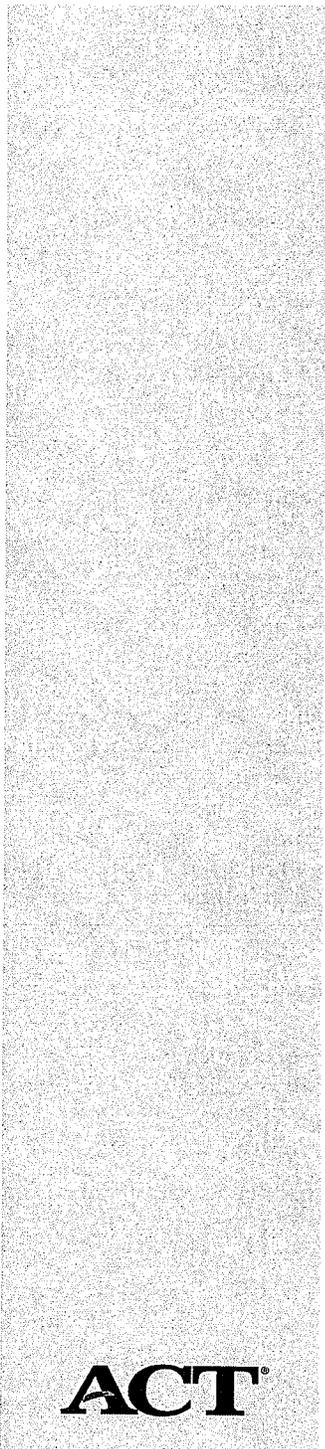
A benchmark score is the minimum score needed on an ACT subject area test to indicate a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in the corresponding credit-bearing college courses.

2007 Texas and National ACT-Tested Graduates Likely to Be Ready for College-Level Work (in percent)



**Ready for College and
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ISSUES IN COLLEGE READINESS

What Are ACT's College Readiness Benchmarks?

ACT's College Readiness Benchmarks are the minimum ACT test scores required for students to have a high probability of success in credit-bearing college courses—English Composition, social sciences courses, College Algebra, or Biology. In addition to the Benchmarks for the ACT® test, there are corresponding EXPLORE® and PLAN® Benchmarks for use by students who take these programs to gauge their progress in becoming college ready in the eighth and tenth grades, respectively. And for students taking COMPASS®, a computer-adaptive course placement assessment used by colleges, we have identified the College Readiness Benchmarks on the COMPASS scale corresponding to success in credit-bearing community college courses.

ACT's College Readiness Benchmarks

College Course or Course Area	Test	EXPLORE Score	PLAN Score	ACT Score	COMPASS Score
English Composition	English	13	15	18	69
Social Sciences	Reading	15	17	21	88
College Algebra	Mathematics	17	19	22	65
Biology	Science	20	21	24	n/a*

Why these courses?

English Composition, College Algebra, and Biology are the first credit-bearing courses most commonly taken by first-year college students. Course placement data also show that reading achievement is most closely aligned with success in credit-bearing social sciences courses in college.

What do we mean by “a high probability of success”?

Students who meet a Benchmark on the ACT or COMPASS have approximately a 50 percent chance of earning a B or better and approximately a 75 percent chance or better of earning a C or better in the corresponding college course or courses. Students who meet a Benchmark on EXPLORE or PLAN are likely to have approximately this same chance of earning such a grade in the corresponding college course(s) by the time they graduate high school.

* COMPASS does not contain a science test.

What data were used to establish the Benchmarks for the ACT?

ACT's College Readiness Benchmarks are empirically derived based on the actual performance of students in college. As part of its Course Placement Service, ACT provides research services to colleges to help them place students in entry-level courses as accurately as possible. In providing these research services, ACT has an extensive database consisting of course grade and test score data from a large number of first-year students and across a wide range of postsecondary institutions. These data provide an overall measure of what it takes to be successful in selected first-year college courses. Data from 98 institutions and over 90,000 students were used to establish the Benchmarks.

For each course, all colleges that supplied data for that course were included. If a college sent data from more than a single year, only data from the most recent year were included. The numbers and types of college varied by course.

Because the sample of colleges in this study is a "convenience" sample (that is, based on data from colleges that chose to participate in ACT's Course Placement Service), there is no guarantee that it is representative of all colleges in the U.S. Therefore, we weighted the sample so that it would be representative of the variety of schools in terms of their selectivity.

How do the Benchmarks for the ACT differ from minimum college course placement scores?

As shown above, the Benchmarks represent a summary across many colleges and many students. The standards for each individual college may vary depending on the material covered in the course and the grading practices within that course. The Benchmarks represent a criterion for success for a *typical* student at a *typical* college. As such, they give students, parents, and counselors useful guidelines to whether a student has mastered the necessary skills to have a reasonable chance of success in college.

ACT will work with any particular postsecondary institution or group of institutions within a state to conduct its own validation studies to establish local benchmarks that, in taking specific institutional and student characteristics into account, can be used as college placement scores.

How were the Benchmarks determined for EXPLORE and PLAN?

The College Readiness Benchmarks for EXPLORE and PLAN were developed using about 150,000 records of students who had taken EXPLORE, PLAN, and the ACT. First, we estimated the probabilities at each EXPLORE and PLAN test score point associated with meeting the appropriate Benchmark for the ACT. We then identified the EXPLORE and PLAN test scores in English, Reading, Mathematics, and Science that corresponded most closely to a 50 percent probability of success at meeting each of the four Benchmarks established for the ACT.

How were the Benchmarks determined for COMPASS?

The College Readiness Benchmarks for COMPASS were developed using the same procedures followed in determining the Benchmarks for the ACT, but with COMPASS data substituted for ACT data.

As with the Benchmarks for the ACT, COMPASS Benchmarks might not serve as the appropriate course placement score at all colleges. Rather, the COMPASS Benchmarks represent a criterion for success for a *typical* student at a *typical* college. ACT will work with any particular postsecondary institution or group of institutions within a state to conduct its own validation studies to establish local benchmarks that, in taking specific institutional and student characteristics into account, can be used as college placement scores.

How can institutions benefit from using the Benchmarks?

Colleges can use the Benchmarks for the ACT as one among several criteria for admission or as a foundation for determining course placement scores. States can use the Benchmarks as a tool for establishing minimum standards for high school graduation in statewide assessment contexts that are aimed at preparing high school graduates for postsecondary education.

Junior high and high schools can use the Benchmarks for EXPLORE and PLAN as a means of evaluating students' early progress toward college readiness so that timely interventions can be made when necessary, or as an educational counseling or career planning tool.

Colleges (especially two-year institutions) can use the Benchmarks for COMPASS to help in efficiently assigning walk-in students to the proper courses and to diagnose student remediation needs.

In all the above cases, the Benchmarks offer users a concise, reliable method of articulating postsecondary expectations to middle and high schools so that timely interventions can be made.



Ready for College and Ready for Work: Same or Different?

Executive Summary

Results of a new ACT study provide empirical evidence that, whether planning to enter college or workforce training programs after graduation, high school students need to be educated to a comparable level of readiness in reading and mathematics. Graduates need this level of readiness if they are to succeed in college-level courses without remediation and to enter workforce training programs ready to learn job-specific skills.

We reached this conclusion by:

- Identifying the level of reading and mathematics skills students need to be ready for entry-level jobs that require less than a bachelor's degree, pay a wage sufficient to support a family, and offer the potential for career advancement
- Comparing student performance on ACT tests that measure workforce readiness with those that measure college readiness
- Determining if the levels of performance needed for college and workforce readiness are the same or different

The study results convey an important message to U.S. high school educators and high school students: We should be educating all high school students according to a common academic expectation, one that prepares them for both postsecondary education and the workforce. Only then—whether they are among the two-thirds who enter college directly after graduation or those who enter workforce training programs—will they be ready for life after high school.

Although the contexts within which these expectations are taught and assessed may differ, the level of expectation for all students must be the same. Anything less will not give high school graduates the foundation of academic skills they will need to learn additional skills as their jobs change or as they change jobs throughout their careers. The results of this study provide ample evidence that we must move the agenda for high school redesign in a direction that will prepare *all* students for success no matter which path they choose after graduation.

Introduction

For decades it has been a commonly held belief that high school students planning to go to college need to take more rigorous coursework than those going directly into the workforce. Today, however, many employers are convinced that in an expanding global economy, entry-level workers need much the same knowledge and skills as college-going students. But such claims have been based mostly on anecdotal rather than empirical evidence. This research brief examines the relationship between college readiness and workforce readiness by asking the question: Are readiness for college and readiness for work the same, or different?

The WorkKeys® System

WorkKeys is ACT's job skills assessment system measuring the "real-world" skills that employers believe are critical to job success. The skills are valuable for any occupation—skilled or professional—and at any level of education. WorkKeys is used by businesses, workforce development groups, and schools to find, hire, train, and retain qualified employees.

Components include:

Job Analysis (Profiling)

Identify the skill requirements and WorkKeys skill levels an individual must have to perform successfully. The WorkKeys job profile database currently includes profiles for more than 12,000 jobs across all industry verticals.

WorkKeys Assessments

Measure the current skills of individuals in nine key areas. WorkKeys tests in Reading for Information and Applied Mathematics were used for the present study.

Training

Improve skills that make individuals more employable and business more competitive through a better trained workforce.

The primary mission of our public education system is to give every student the opportunity to live a meaningful and productive life, which includes earning a wage sufficient to support a small family. All students need to develop the knowledge and skills that will give them real options after high school. No student's choices should be limited by a system that can sometimes appear to have different goals for different groups. Educating some students to a lesser standard than others narrows their options to jobs that, in today's economy, no longer pay well enough to support a family of four. Widening access to the American dream through public education has always been one of the foundations of our society, and it is more critical than ever to our ability to remain competitive in today's global economy.

Our new finding has important implications for U.S. high school education. It suggests that all high school students should be educated according to a common academic expectation that prepares them for both postsecondary education and the workforce. This means that all students should be ready and have the opportunity to take a rigorous core preparatory program in high school, one that is designed to promote readiness for both college and workforce training programs.

What Is the Expectation for Workforce Training Readiness?

Our first step was to define workforce readiness. We began by referring to the Occupational Information Network (O*NET), a comprehensive national database of job and worker attributes developed for the Employment and Training Administration of the U.S. Department of Labor. O*NET classifies jobs using five zones, each defined by particular education, training, and experiential requirements.

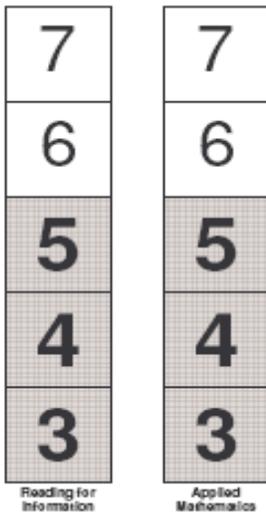
We focused on Job Zone 3 because the occupations in this zone are likely to offer a wage sufficient to support a small family¹, provide the potential for career advancement, and are projected to increase in the future (U.S. Department of Labor, 2004). Zone 3 is the highest O*NET level that includes jobs that do not require a bachelor's degree, but which likely require some combination of vocational training and/or on-the-job experience, or an associate's or higher degree (*O*NET OnLine Help*, n.d.). Examples include electricians, construction workers, upholsterers, and plumbers.

By selecting O*NET Zone 3, we are essentially defining workforce readiness as workforce *training* readiness, since Zone 3 jobs require high school graduates to

WorkKeys Level Scores

Developed with input from employers, labor organizations, educators, and policymakers, ACT’s WorkKeys tests are criterion-referenced tests anchored to the skills needed for workforce readiness in nine areas.

Jobs are profiled using the same levels to assess individuals’ workforce readiness skills. An individual’s readiness for a particular job can be compared to the requirements of the job, as defined through the job profiling process. In this study, the level of knowledge and skills considered to represent work readiness was profiled at a Level 5 for both reading and mathematics.



Level 5 WorkKeys Applied Mathematics and Reading for Information scores are often used in state and community workforce readiness certificate programs across the nation. These programs are used to qualify prospective worker readiness for a majority of jobs in a particular locale.

have the foundational skills necessary to learn additional job-specific skills throughout their careers.

What are the minimum skill standards that high school graduates need to enter Zone 3 occupations? We used job profiles from ACT’s WorkKeys program (see sidebar, previous page), O*NET occupational data that identify the minimum level of knowledge and skills needed to enter each of these profiled jobs, and expert ratings to derive a profile that identifies the reading and mathematics skills needed for students to be ready to enter the vast majority—90 percent—of the profiled Zone 3 occupations after high school.² On a WorkKeys scale that reports scores for Reading for Information and Applied Mathematics ranging from Level 3 to Level 7 (see sidebar, this page), this level of knowledge and skills was profiled at a Level 5 for *both* reading and mathematics.

Do College Readiness and Workforce Training Readiness Represent a Common Expectation?

After defining workforce training readiness for 90 percent of the profiled Zone 3 occupations that require training after high school, we examined whether the level of readiness for workforce training programs is the same as or different than the level of readiness needed for success in college.

Commonalities: Readiness Levels

Because WorkKeys and the ACT[®] test are measures of workforce and college readiness, respectively, we based our analysis on WorkKeys and ACT scores from a statewide sample of high school eleventh-grade students over a four-year period. We conducted a statistical concordance between the respective college and workforce training readiness levels in reading and mathematics from both programs.³ The concordance between the ACT College Readiness Benchmarks (see sidebar, next page) and WorkKeys Level 5 shows that the levels of readiness in reading and mathematics are comparable. Therefore, it is reasonable to conclude that the expectations of students who choose to enter workforce training programs for jobs that are likely to offer both a wage sufficient to support a small family and potential career advancement should be no different from the expectations of students who choose to enter college after high school graduation. Table 1 summarizes the comparability analysis.

Table 1
Comparability between WorkKeys Job Profile Level 5 and ACT College Readiness Benchmarks in Reading and Mathematics⁴

WorkKeys Test	WorkKeys Readiness Level	Comparable ACT Score Range and College Readiness Benchmark
Reading for Information	5	19–23 Benchmark = 21
Applied Mathematics	5	18–21 Benchmark = 22

ACT College Readiness Benchmarks

The ACT, the most widely accepted and used test by postsecondary institutions across the U.S. for college admission and course placement, measures students' academic readiness to make successful transitions to college and work after high school. ACT has defined college readiness empirically by establishing College Readiness Benchmarks representing the minimum ACT test scores required for students to have a high probability of success in corresponding credit-bearing first-year college courses. The ACT Benchmarks are based on course placement data from a nationally representative sample of postsecondary institutions. The Benchmarks reflect the ACT scores students need to earn to have at least a 75 percent or greater chance of obtaining a course grade of C or better. The College Readiness Benchmarks for Reading and Mathematics are:

- Reading: 21
- Mathematics: 22

The results of this analysis address the comparability of the *levels of expectation* represented by college and workforce training readiness. Because each test measures only one of the two kinds of readiness and is not perfectly correlated with the other test, a given individual's ACT test score *cannot* be substituted for a WorkKeys test score or vice versa.

Commonalities: Skills

This analysis provides empirical evidence supporting the contention that the expectations for college readiness and for workforce training readiness are comparable. This empirical comparability is further supported by similarities in the skills defined for college and workforce training readiness shown in Tables 2 and 3.

For reading and mathematics, respectively, the two tables contain all of the ACT College Readiness Standards in the 20–23 range (the score range that contains the corresponding College Readiness Benchmark) and all of the WorkKeys skills at Level 5. Because WorkKeys is designed expressly to reflect what businesses expect of entering workers and the ACT is designed expressly to reflect what colleges expect of entering students, the two assessment programs have uniquenesses in what they measure and in the scores they report. But there are also commonalities in the expectations for readiness in the two tests, as shown by the skill groupings in these tables.

**Table 2
Reading Skills for College and Workforce Training Readiness**

Skill Group	ACT Reading Test College Readiness Standards (20-23 Range)	WorkKeys Reading for Information Test Skills (Level 5)
<p>Main Ideas and Supporting Details</p>	<p>Infer the main idea or purpose of straightforward paragraphs</p> <p>Understand the overall approach taken in a passage (e.g., point of view, kinds of evidence used)</p> <p>Locate important details</p> <p>Make simple inferences about how details are used in a passage</p>	<p>Understand main ideas, topic sentences, and the relationships among sentences in a paragraph</p> <p>Correctly use technical terms when describing the main idea and supporting details in a passage</p> <p>Recognize organizational structures of passages to identify pertinent details and recognize appropriate applications</p> <p>Select important details to clarify meaning</p>
<p>Sequential, Comparative, and Cause-Effect Relationships</p>	<p>Order simple sequences of events</p> <p>Identify clear relationships between people, ideas, and events</p> <p>Identify clear cause-effect relationships</p>	<p>Apply straightforward instructions to new situations</p> <p>Apply complex instructions that include conditionals to situations described in a passage</p>

Skill Group	ACT Reading Test College Readiness Standards (20-23 Range)	WorkKeys Reading for Information Test Skills (Level 5)
Meaning of Words	Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements	Figure out the correct meaning of a word based on how the word is used Understand the definitions of acronyms defined in a passage Identify the appropriate definition of words with multiple meanings based on context
Generalizations and Conclusions	Draw generalizations and conclusions about people, ideas, and events Draw simple generalizations and conclusions using details that support the main point of a passage	Apply technical terms to stated situations Apply given information to new situations

Table 3
Mathematics Skills for College and Workforce Training Readiness

Skill Group	ACT Mathematics Test College Readiness Standards (20-23 Range)	WorkKeys Applied Mathematics Test Skills (Level 5)
Algebra and Algebraic Thinking	Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor Evaluate algebraic expressions by substituting integers for unknown quantities Add and subtract simple algebraic expressions Solve routine first-degree equations Perform straightforward word-to-symbol translations Multiply two binomials Evaluate quadratic functions, expressed in function notation, at integer values	Solve problems that include a considerable amount of extraneous information Calculate using several steps of logic Perform single-step conversions within or between systems of measurement Look up and use a single formula Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes) Find the best deal using one- and two-step calculations and then comparing results Calculate percentages, percentage discounts, or percentage markups Divide negative numbers Decide what information, calculations, or unit conversions to use to solve the problem Use exponents, including exponents in fractions and formulas
Geometry and Geometric Thinking	Compute the area and perimeter of triangles and rectangles in simple problems Use geometric formulas when all necessary information is given Locate points in the coordinate plane Comprehend the concept of length on the number line	Solve geometric problems that include a considerable amount of extraneous information Calculate using several steps of logic Calculate perimeters and areas of basic shapes (rectangles and circles) Look up and use a single formula

Skill Group	ACT Mathematics Test College Readiness Standards (20-23 Range)	WorkKeys Applied Mathematics Test Skills (Level 5)
Geometry and Geometric Thinking (continued)	Exhibit knowledge of slope Find the measure of an angle using properties of parallel lines Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)	Decide what information, calculations, or unit conversions to use to solve the problem
Data Representation and Statistical Thinking	Calculate the missing data value, given the average and all data values but one Translate from one representation of data to another (e.g., a bar graph to a circle graph) Determine the probability of a simple event Exhibit knowledge of simple counting techniques	Average hours and minutes or other mixed units in one system Solve problems that include a considerable amount of extraneous information Calculate using several steps of logic sometimes involving graphs, charts, or tables

Commonalities: Sample Test Questions

Further parallels in the levels of readiness for college and workforce training programs can be seen in the test questions used to assess the skills measured in the two tests. Table 4 contains examples from the ACT Reading Test and the WorkKeys Reading for Information Test. Although the contexts of the passages are unique—the ACT passage is a prose selection and the WorkKeys passage is a workplace communication—the underlying reading skills being measured are similar.

**Table 4
Comparison of College and Workforce Training Readiness:
Reading Test Questions**

ACT Reading 20-23 Range [Order simple sequences of events]	WorkKeys Reading for Information Level 5 [Apply straightforward instructions to new situations]
<p><i>Excerpt from passage*:</i></p> <p>Mr. Brook had come home early and lighted a fire in the little grate in his sitting room. He felt comfortable and at peace that evening. He sat before the fire in his stocking feet, with a volume of William Blake on the table by his side, and he had poured himself a halfglass of apricot brandy. At ten o'clock he was drowsing cozily before the fire, his mind full of cloudy phrases of Mahler and floating half-thoughts. . . . He had been walking across the campus that afternoon when Madame Zilensky stopped him and began some preposterous rigmarole, to which he had only halflistened: he was thinking about the stack of canons turned in by his counterpoint class. Now the words, the inflections of her voice, came back to him with insidious exactitude. Madame Zilensky had started off with the following remark: "One day, when I was standing in front of a <i>pâtisserie</i> (pastry shop), the King of Finland came by in a sled."</p> <p>Mr. Brook jerked himself up straight in his chair and put down his glass of brandy. The woman was a</p>	<p><i>Passage:</i></p> <p>MEMO TO: Publications Department Assistants FROM: Publications Department Manager</p> <p>Thank you in advance for helping the editors proof the Valve Adjustment manual and documents associated with the new line of valves. The following instructions are for proofing the manuscript copy of the manual scheduled for the beginning of next week. Additional instructions will be provided when the preliminary copy with typefaces, graphics, copy placement, and headings is proofed.</p> <p>Team Proofing Stage You will be paired with another proofer, the <i>reader</i>, and you will be issued two versions of the same section. One version is the marked-up copy, which contains modifications in handwritten red ink. The reader will read aloud each word, punctuation mark, and number on the marked-up section.</p>

ACT Reading 20-23 Range [Order simple sequences of events]	WorkKeys Reading for Information Level 5 [Apply straightforward instructions to new situations]
<p>pathological liar. Almost every word she uttered outside of class was an untruth. . . .</p> <p>Mr. Brook finished off the rest of his brandy. And slowly, when it was almost midnight, a further understanding came to him. The reason for the lies of Madame Zilensky was painful and plain. All her life long Madame Zilensky had worked—at the piano, teaching, and writing those beautiful and immense twelve symphonies. Day and night she had drudged and struggled and thrown her soul into her work, and there was not much of her left over for anything else. Being human, she suffered from this lack and did what she could to make up for it. . . . Through the lies, she lived vicariously. The lies doubled the little of her existence that was left over from work and augmented the little rag end of her personal life.</p> <p>* Adapted from Carson McCullers, "Madame Zilensky and the King of Finland." ©1955 by Carson McCullers.</p>	<p>The other copy is the new version, and it should incorporate all edits from the marked-up version. The proofer must mark in red ink any missed edits and any additional modifications. Most likely further corrections will be needed.</p> <p>Single Proofing Stage After the corrections have been made and checked from the team proofing stage, you should do a single proof on the new copy. Mark corrections in red ink. Continue to repeat this process until the materials are error free.</p> <p>During your single proof, read every word aloud. In this way you will both see and hear the copy, which will enable you to better detect a missing word or number.</p> <p>Reminder: Spell-check programs have reduced misspellings considerably, but you should be aware of specialized terms that the computer's dictionary does not know.</p> <p>Once the manual is ready to print, I will need you to follow the same instructions to proof the technical specification sheets for each valve type. If you have any questions, please speak to me or to one of the editors.</p>
<p><i>Question:</i></p> <p>The <i>first</i> insight about Madame Zilensky that came to Mr. Brook during his cozy evening was that she was a great:</p> <p>A. composer. B. teacher. C. performer. D. liar.</p>	<p><i>Question:</i></p> <p>You are an assistant. According to the memo shown, during the team proofing stage, what is the next step after you mark any needed modifications?</p> <p>A. Further clerical corrections will be made. B. The proofing stages will reveal no further corrections. C. The proofing time on the project will be reduced. D. The editors will meet the printer deadline.</p>

The commonalities in mathematics skills are illustrated by the sample questions in Table 5. While the questions present problems in different contexts, the underlying mathematics skills each pair requires for their solutions are similar.

Table 5
Comparison of College and Workforce Training Readiness:
Mathematics Test Questions

ACT Mathematics 20-23 Range [Evaluate algebraic expressions by substituting integers for unknown quantities; solve routine first-degree equations]	WorkKeys Applied Mathematics Level 5 [Look up and use a single formula; perform single-step conversions within or between systems of measurement]
<p>The number of bricks, B, needed to build a wall of uniform length L feet and uniform height H feet can be found by the equation $B = 7LH$. A wall of uniform height that is 20 feet long is constructed using 350 bricks. What is the height, in feet, of the wall?</p> <p>A. 1.75 B. 2.5 C. 17.5 D. 50</p>	<p>A refrigeration system at your company uses temperature sensors fixed to read Celsius ($^{\circ}\text{C}$) values, but the system operators in your control room understand only the Fahrenheit scale. You have been asked to make a Fahrenheit ($^{\circ}\text{F}$) label for the high temperature alarm, which is set to ring whenever the system temperature rises above -10°C. What Fahrenheit value should you write on the label?</p> <p>A. -23°F B. -18°F C. 14°F D. 26°F</p>

ACT Mathematics 20-23 Range	WorkKeys Applied Mathematics Level 5										
[Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average]	[Calculate percentages, percentage discounts, or percentage markups]										
<p>The Sunrise Preschool held its annual book fair for 3 days. The total profit for the 3 days was \$2,525. The profit, in dollars, is shown for each of the 3 days in the bar graph below.</p> <table border="1"> <caption>Profit Data from Bar Graph</caption> <thead> <tr> <th>Day</th> <th>Profit (Dollars)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1,500</td> </tr> <tr> <td>2</td> <td>800</td> </tr> <tr> <td>3</td> <td>225</td> </tr> <tr> <td>Total</td> <td>2,525</td> </tr> </tbody> </table> <p>Approximately what percent of the book fair's profit over the 3 days did the preschool make on Day 1 ?</p> <p>A. 25% B. 33% C. 50% D. 60%</p>	Day	Profit (Dollars)	1	1,500	2	800	3	225	Total	2,525	<p>As a dietitian, you help clients manage their sugar intake. A popular fruit drink contains a total of 28 grams of carbohydrates. Of that total, 19 grams are sugar. About what percent of the total carbohydrates is the sugar?</p> <p>A. 7% B. 9% C. 15% D. 68%</p>
Day	Profit (Dollars)										
1	1,500										
2	800										
3	225										
Total	2,525										

Summary

This study provides empirical evidence that the levels of readiness that high school graduates need to be prepared for college and for workforce training programs are comparable. These empirical results are also supported by commonalities seen in the types of knowledge and skills students need to be ready for college and workforce training programs, even though these skills are often taught and assessed in different contexts. All of these skills can be acquired through rigorous high school courses, regardless of the context (academic or career focused) within which they are taught. The results of this study underscore the importance of having a common expectation for all students when they graduate from high school: one that prepares *all* high school graduates for both credit-bearing entry-level college courses and workforce training programs associated with jobs that are likely to offer both a wage sufficient to support a small family and the potential for career advancement.

If we are to be competitive in today's global economy, it is critical for us as a nation to give every high school graduate the opportunity to live a meaningful and productive life and earn a decent wage. All high school graduates should have a sound foundation of knowledge and skills so that they can enter college or workforce training programs ready to learn.

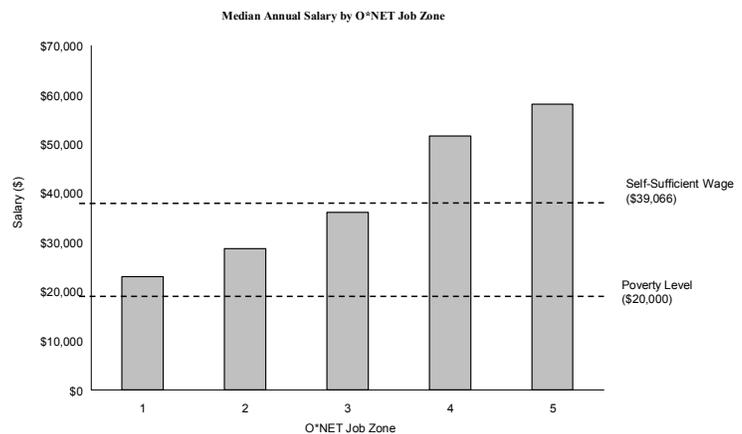
Action Steps for Policymakers

Following are recommended action steps that state policymakers can take toward achieving a common expectation that *all* high school graduates will be ready for college and for workforce training programs:

- Use the common expectation to establish a statewide commitment that all students will be prepared for college and workforce training programs when they graduate from high school.
- Require that all students take a rigorous core preparatory course program in high school.
- Hold schools and states accountable for preparing all students for college and workforce training programs through rigorous core courses.
- Ensure that state standards reflect the skills needed for college and workforce training readiness for all students.
- Provide funding for measures of college and workforce training readiness skills to be used as statewide high school assessments.
- Begin measuring student progress with aligned assessments as early as the eighth grade to monitor progress, make appropriate interventions, and maximize the number of high school graduates who are ready for college and workforce training programs.
- Use the common expectation of college and workforce training readiness as a prerequisite for entry into funded training or development programs (e.g., incumbent worker training) and offer remediation for those who do not meet this expectation.
- Communicate the common expectation of college and workplace training readiness to all stakeholders, including businesses, workforce and economic development associations, and educational institutions.

Notes

¹ Comparison of median wages for O*NET job zones was based on the following chart (*O*NET Consortium - Production Database*, n.d.):



Self-sufficient wage based on median recommended budget for a family of 4 (two parents two children) averaged across 2600 U.S. communities (EPI). Poverty level provided by U.S. Dept of Health and Human Services (2006)

A “self-sufficient” wage is typically defined as the money needed to meet basic needs such as food, housing, utilities, clothing, child care, and health care plus a small allowance for personal expenses and savings.

² ACT’s WorkKeys is a standardized job skills and assessment system that businesses commonly use for employee selection and training. WorkKeys includes a job profiling/job analysis component used to identify the critical skills required to enter a job and perform it effectively. There are 120 O*NET Zone 3 jobs for which ACT has a WorkKeys profile estimate based on either the WorkKeys job profile database or expert

ratings. The WorkKeys profile estimates for these jobs were used to identify the reading and mathematics skills needed for a majority of the profiled Zone 3 occupations.

³ To determine how workforce training readiness compares to college readiness, we analyzed data from 476,847 high school juniors in Illinois who took the ACT, the WorkKeys Reading for Information Test, and the WorkKeys Applied Mathematics Test between 2001 and 2004. These tests are administered as part of the Illinois Prairie State Achievement Examination program, a statewide assessment administered annually to all eleventh-grade students. We statistically aligned the scores on the two WorkKeys Tests (which represent workforce training readiness) to the scores on the ACT Reading and Mathematics Tests (which represent college readiness).

⁴ The statistical concordance reveals that the Level 5 score on the Reading for Information test corresponds to an ACT score range that includes the ACT College Readiness Benchmark for Reading as its midpoint; the Level 5 score on the Applied Mathematics test corresponds to an ACT score range that is just one score point below the ACT College Readiness Benchmark for Mathematics. However, because WorkKeys and the ACT do not measure the same things and are not perfectly correlated, scores on the two tests are not interchangeable.

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